SolarMate 36/48V

Solar Battery Charger Controller

INSTALLATION AND OPERATION MANUAL

Version 1.0E

PREFACE

This manual contains important information regarding Installation and safe operation of this unit.

Notice:

- The contents of this manual are bound to change without prior notice.
- We cannot assume responsibility for errors in this manual or consequences thereof. However should any error be detected, we would be grateful if you could inform us.

SAFETY INSTRUCTIONS

Risk of Electric Shock

Direct Current (DC) sources are connected to this device. To avoid risk of electric shock during maintenance or installation please ensure that all DC connections are disconnected.

Risk of Electric Shock

When PV module or panel is exposed to light, it starts to supply high DC voltage. Be sure to turn off DC switch before commencing the maintenance, and make sure the cables from PV panel are properly sealed after disconnection.

Risk of Electric Shock

After disconnecting the power sources, the product will continue to discharge at DC terminal for a short period. Before commencing maintenance, please wait for at least 2 minute after the power is disconnected.

Authorized Personnel Only

Only authorized personnel are allowed to install, commission and repair the product.

Warning

If the product is used in a manner which is not covered by the scope of warranty, the protection provided by the product may be impaired.

SCOPE OF WARRANTY

The product comes with a standard 1-year warranty. This warranty includes all defects of design, components and manufacturing. The Warranty is void and does not cover any defects or damages caused by any of the following circumstances:

- Seal on the product is broken
- The product has been misused, neglected, or abused
- Improper transportation and delivery
- The product has been used or stored in conditions outside its electrical or environmental specifications
- The product has been used for purposes other than for which it was designed
- The product has been used outside its stated specifications, operating parameters and application
- Acts of third parties, atmospheric discharges, excess voltage, chemical influences, natural wear and tear and for loss and damage in transit
- Improper testing, operation, maintenance, adjustment, repair, or any modification of any kind not authorized in writing by the supplier
- The product has been connected to other equipment with which it is not compatible
- Use and application beyond the definition in this manual
- Application beyond the scope of applicable safety standards or grid codes
- Acts of nature such as lighting, fire, storm, flood, vandalism and etc.

The right to repair and/or replace the defective product is at the supplier's sole discretion. Any warranty claim shall be asserted in writing to the supplier within 5 working days after notice of product failure. The supplier is not responsible for damages beyond the scope of this warranty.

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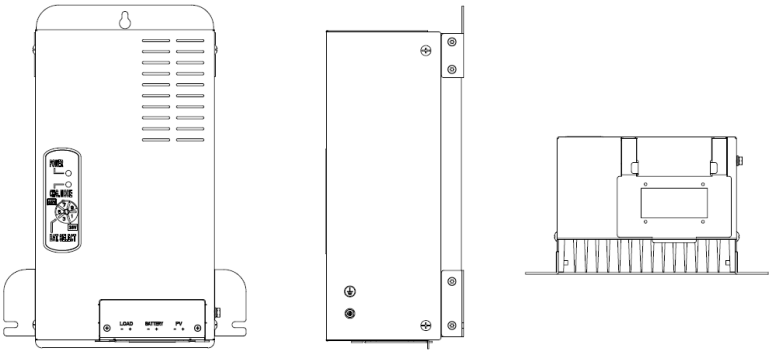
1. PRODUCT OVERIVEW

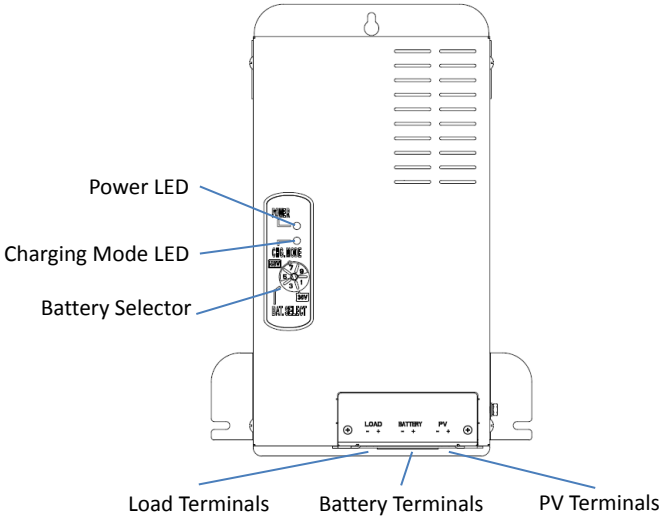
SolarMate 36/48V is a solar battery charger controller with built-in MPPT (Maximum Power Point Tracker) for PV panel and 24A charging capability for various types of lead-acid batteries.

1.1 Product Outlook



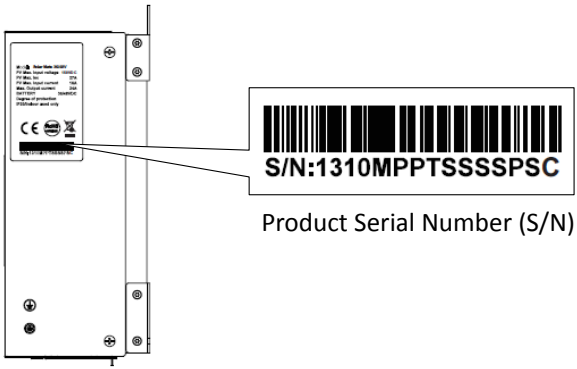
Front View Side View Bottom View

1.2 Function of Major Parts

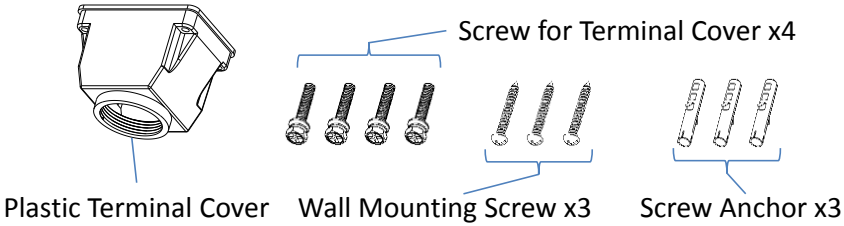


1.3 Identify the Product

Each SolarMate 36/48V is assigned with a unique serial number which can be found in the rating label located at the side cover as shown below. Please report this serial number to the service representative when in need of service. In the example below, the serial number (S/N) is 1310MPPTSSSSPSC.



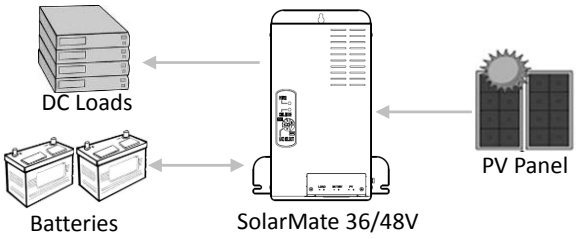
1.4 Scope of Delivery



Description	Quantity
SolarMate 36/48V	1
Plastic Terminal Cover	1
Screw for Terminal Cover	4
Wall Mounting Screw	3
Screw Anchor	3

1.5 Typical Applications

SolarMate 36/48V can be connected with PV panel which supplies DC input power, and convert the power to either supply various DC loads or charge batteries with optimized efficiency. A typical application is shown in the diagram below.



Example of Typical Application

1.6 Key Features

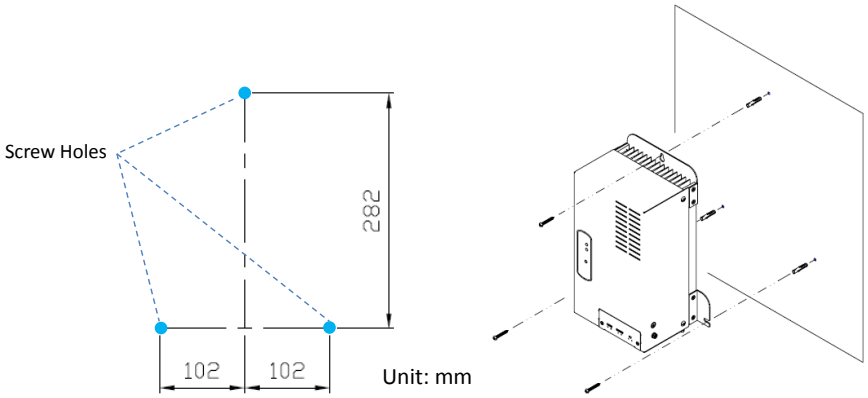
- Able to supply power to DC loads
- Built-in MPPT (Maximum Power Point Tracker)
- Lightning protection
- 3-stage battery charging control (bulk, absorption, and float)
- Overload protection
- Protection for reversed polarity of PV panel and batteries

2. INSTALLATION

2.1 Mount the Product on the Wall

To mount the product on the wall, please follow the steps below:

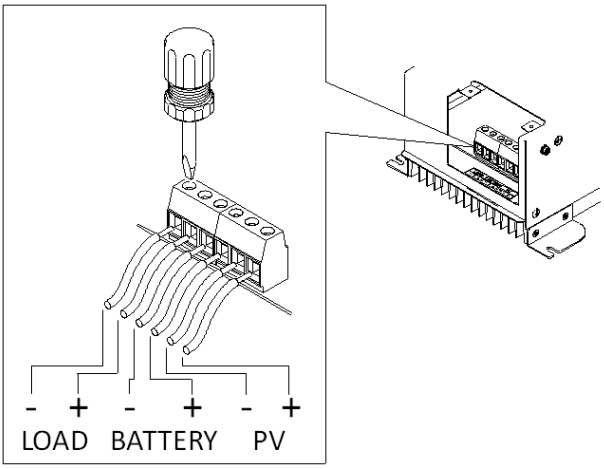
1. Select a solid, nonflammable wall which can withstand the weight of the product. The product is designed for indoor use so the installed location shall not be exposed to direct sunlight or rainfall.
2. Mark the location of 3 screw holes on the wall according to the distance specified in the diagram below.
3. Drill the screw holes at the marked locations.
4. Insert three screw anchors.
5. Place the product on the wall and align it with the screw holes.
6. Use three screws to fix the product on the wall as shown in the diagram below.



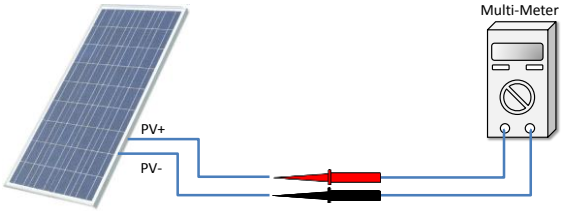
WARNING!
Please install the product in a dry, protected location which is away from high temperature, direct water spray, moisture of salt water and corrosive gas. Improper installed environment will result in void of warranty.

2.2 Connection of Wires

The wires from PV panels, batteries and DC loads shall be connected to the terminal block which can be found by opening the cover in the bottom as shown below. It's recommended that single-core wires be used and the gauge of the wires shall be within the range AWG 20 ~ AWG 6.



Before connecting the wires from PV panel, it's important to conduct polarity check by using a multi-meter.



WARNING!

The terminals of PV panel contain high DC voltage while exposing to light. It's strongly recommended that a disconnect device shall be installed between the PV panel and the product so that the DC power can be disconnected while connecting the wires.

The batteries shall be configured according to its charging characteristics so as to match the setting on the Battery Selector (please refer to Section 3.2 for details).

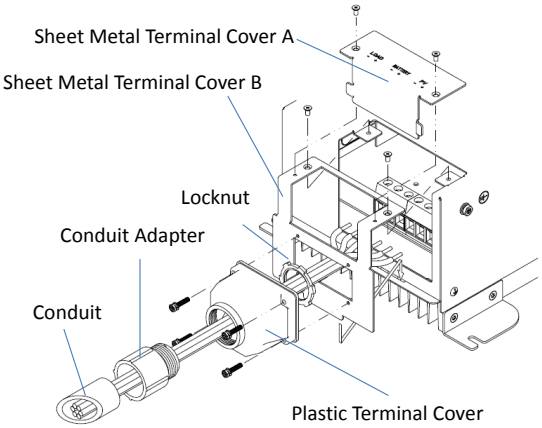
Given that the maximum charging current is 24A, the total capacity of batteries shall be greater than **80Ah**.

WARNING!
Installation must be performed with care for the high battery voltage in series. Do NOT place anything between battery cable ring terminals and terminals on the product. The terminal screw is not designed to carry current.

WARNING!
Please DO NOT install the product in a sealed cabinet together with the batteries which might emit corrosive gas and damage the product.

It's recommended that a conduit and conduit adapter with locknut, which can be easily purchased in hardware store, shall be used for the protection of wires. Inner thread of the plastic cover is M35*1.5P and ¾ inch conduit is recommended. A plastic terminal cover is delivered together with the product for fitting the conduit as shown in the diagram below.

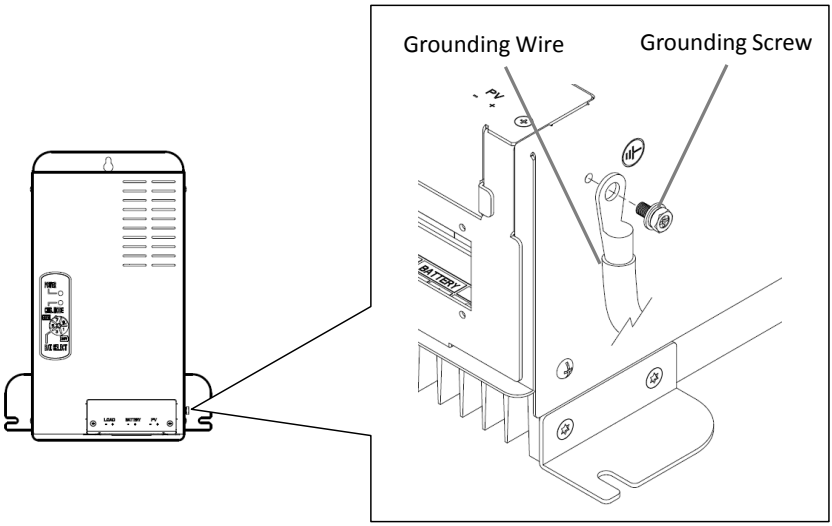
1. Remove sheet-metal terminal cover A and B from the chassis.
2. Assemble the conduit adapter and locknut to the plastic terminal cover, and then assemble the plastic terminal cover onto sheet-metal terminal cover B with 4 screws.
3. Put the wires through the conduit, conduit adaptor, plastic terminal cover, locknut and sheet-metal terminal cover B.
4. Connect the wires to the terminal block with torque 1.76 N-m.
5. Insert the tenon of sheet-metal terminal cover B into the slot below the terminal block, and then fix the sheet-metal terminal cover B onto the chassis with 2 screws.
6. After all conduits are assembled, check if wires are fixed well on the terminal block.
7. Fix the sheet-metal terminal cover A onto sheet-metal terminal cover B with 2 screws.



2.3 Connect the Grounding Wire

WARNING!
The product is classified as Class I equipment which requires grounding on the enclosure to prevent the user from electric shock.

A grounding SEMS screw can be found on the right side of enclosure. Remove the grounding screw and fix the grounding wire with the screw as shown below.



2.4 Commissioning

After installing the product by following the steps in Section 2.1~2.3, conduct the first commission with the following steps:

1. Check if all the wires are connected correctly, especially the polarity.
2. Set the Battery Selector according the batteries used (please refer to Section 3.2).
3. Switch on the DC power from battery and then the DC power from PV panel.
4. If the DC voltage from PV panel is larger than battery voltage, the Power LED will be on.
5. Power LED shall be on constantly if no abnormal condition is detected.

3. OPERATION

3.1 Maximum Power Point Tracker (MPPT)

PV panel's output power is mainly subject to the illumination. However under given illumination, the output power can still be maximized with proper control. MPPT serves the function to ensure maximum power is generated by the PV panel at any illumination. MPPT works automatically as long as the PV panel voltage is sufficient, so as to ensure the batteries are charged by PV power at optimized efficiency.

3.2 3-stage Charging Control

Intelligent charging control can not only maximize the capacity of batteries but also prolong their lifetime. The product's charging control is designed to be 3 stages:

1. Bulk Charge Stage

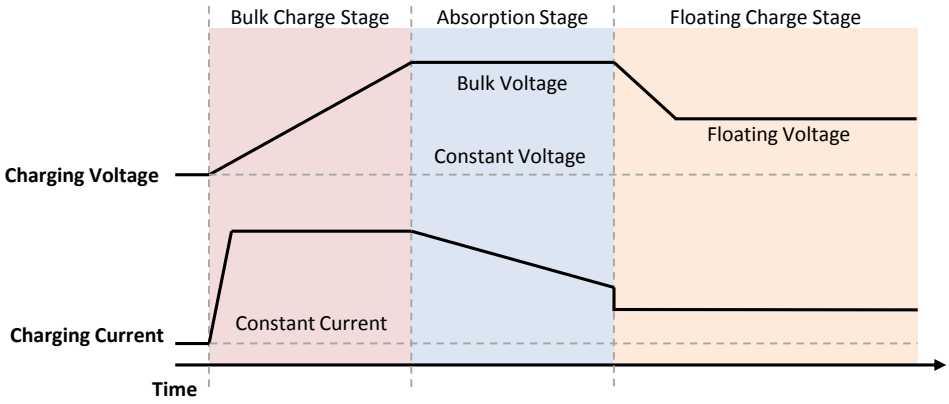
In this stage, the battery voltage is low and is charged with increasing charging voltage and maximum constant charging current.

2. Absorption Stage

In this stage, the charging voltage will be hold at bulk voltage and charging current gradually decreases.

3. Floating Charge Stage

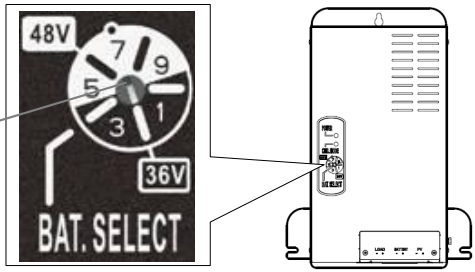
In this stage, the battery is deemed fully charged. Charging voltage and current are both hold at a constant level to maintain the battery capacity at full level.



3-stage Charging Control

Different types of battery require different setting on Bulk Voltage and Floating Voltage. The setting can be done by the Battery Selector according the table below.

Use a flat screw driver to rotate the switch until the recess points to the desired number



Switch Position	Battery Type/ Function	Floating voltage (V)	Bulk/ Equalize voltage (V)	Nominal Battery Voltage
0	Equalization setting	39.6	*45	36-Volt
1	Deep Cell Lead Acid 2	39.9	45	
2	Deep Cycle Lead Acid 1	40.2	43.8	
3	Gel Cell	40.5	42.3	
4	PcCa-lead Calcium	39.6	42.9	
5	Equalization setting	52.8	*60	48V-Volt
6	Deep Cell Lead Acid 2	53.2	60	
7	Deep Cycle Lead Acid 1 (Default Setting)	53.6	58.4	
8	Gel Cell	54	56.4	
9	PcCa-lead Calcium	52.8	57.2	

3.3 Equalization Charge

Equalization charge is a special charging mode. After a series of repeated charge/discharge cycles, the cells in the battery might become unequal in terms of voltage and discharge current, mainly because of accumulated sulfate on the surface and stratified electrolyte, and resulted in capacity decrease. Equalization charge can mitigate the problem and prolong the battery life.

Please follow the steps below to perform Equalization Charge,

1. Remove all DC loads connected to the product.
2. Remove all battery vent caps.
3. Make sure the battery's water is at normal level. Use only distilled water for filling batteries.
4. Set the BATTERY SELECTOR switch to position "0" or "5".
5. Reset the BATTERY SELECTOR to the appropriate setting according to the type of batteries after the Equalization Charge is completed.

Frequency of Equalization Charge
Equalization charge shall be performed every month or two depending on the usage of battery.

3.4 Photovoltaic Charge and Load Control

SolarMate 36/48V can regulate up to 24A continuous current at 36/48V for charging batteries. In the meantime it can provide maximum 7A current to DC loads.

SolarMate 36/48V detects the battery voltage and determines when the DC loads shall be disconnected under over-discharge or over-loading conditions, and reconnected when battery voltage is recovered to higher level.

DC loads are disconnected when the battery voltage is below **LVD** ("Low Voltage Disconnect) point. DC loads will be reconnected when the battery voltage reaches **LVR** ("Low Voltage Reconnect"). LVD and LVR setting can be found in product specification.

3.5 PV Panel Disconnection during Night Time

To prevent the PV panel from reversed leakage power, SolarMate 36/48V automatically disconnect the PV panel during night time.

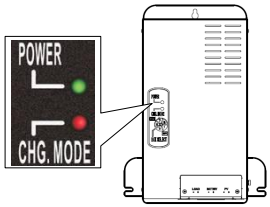
3.6 Over Temperature Protection

SolarMate 36/48V can charge batteries at full capacity when the ambient temperature is below 50℃. When the temperature goes to 50-65℃, SolarMate 36/48V will perform power de-rating by limiting its output power.

If the temperature goes beyond 65℃, the output will be stopped and the LED status will indicate over-temperature fault.

3.7 LED Status and Corresponding Operation Status

The operation status of SolarMate 36/48V can be told by checking the status of 2 LEDs: Power LED and Charge Mode LED.



POWER LED	CHG. MODE LED	Operation Mode	Description
Green (on)	Red (on)	Normal	Charging (V_{BAT}<LVD)
Green (on)	Orange (on)		Charging (LVD<V_{BAT}<LVR)
Green (on)	Green (on)		Charging (V_{BAT}>LVR)
Green (on)	Red (blink)	De-rating (50-65℃)	Charging (V_{BAT}<LVD)
Green (on)	Orange (blink)		Charging (LVD<V_{BAT}<LVR)
Green (on)	Green (blink)		Charging (V_{BAT}>LVR)
Green (blink)	Red (on)	Fault	Over loaded
Green (blink)	Orange (on)		Over temperature (>65℃)
Green (blink)	Red (blink)		PV over voltage
Green (blink)	Orange (blink)		PV under voltage
Green (blink)	Off		Battery over voltage
Off	Orange (blink)		Battery under voltage

V_{BAT}: Battery voltage
LVD: Low voltage disconnect point
LVR: Low voltage recovery point

4. SPECIFICATION

Battery voltage setting	**36V$_{DC}$**	**48V$_{DC}$**
Rated charge current	24A	
Load current	7A	
Input voltage range	40-150V$_{DC}$	
Max. PV open circuit array voltage	150V$_{DC}$	
Max. recommended input power (W)	900	1200
Typical idle consumption	< 10mA	
Overload protection (DC load)	14A >5s	
	10.5A >20s	
	8.75A (de-rating)	
Bulk charge	43.8V(default)	58.4V(default)
Floating charge	40.2V(default)	53.6V(default)
Over charge disconnection	47.4V	63.2V
Over charge recovery	42.0V	56.0V
Over discharge disconnection	32.4V	43.2V
Over discharge reconnection	36.9V	49.2V
Low voltage reconnect	36.9 ± 0.3 VDC	49.2 ± 0.3 VDC
Low voltage disconnect	32.4 ± 0.3 VDC	43.2 ± 0.3 VDC
Ambient temperature	0-50℃ (full-rating) 50－65℃ (de-rating)	
Altitude	<3000 m	
Cooling	Nature Cooling	
Protection class	IP20	
Terminal size (fine/single wire)	AWG # 20 ~ 6	
Dimension (D x W x H)	124*220*311	
Net Weight (kg)	5.4	

5. TROUBLESHOOTING

Problem	Possible Cause	Suggested Action
No response (Both POWER LED and CHG. MODE LED are off)	No power from battery (note: system power is supplied by battery only)	Check if the battery is connected correctly.
LEDs indicate “Over Temperature” fault	Ambient temperature is too high	Improve the ventilation. Check if the PV input voltage is normal.
It takes too long to charge the battery to full level.	The unit has entered into “de-rating” mode due to high temperature	Check if the ambient temperature is higher than 50℃. If yes, improve the ventilation.
	PV panels are deteriorated	Check the PV panel’s condition and replace it if needed.
	PV- cable is wrongly connected to BAT-	Check if the PV panel’s cables are connected correctly.

6. DISPOSAL

In the event the product reaches the end of its service life, please contact the local dealer for disposal instructions.

The product must not be disposed of with the household waste.

Disposal of the product at the end of its service life shall be done in accordance with applicable disposal regulations for electronic waste.